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DESCRIPTIONS OF NEW SPECIES OF MATSUCOCCUS (HEMIPTERA : COCCIDAE).

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The following preliminary descriptions of apparently new species belonging in the coccid genus *Matsucoccus* are published at this time in order to make the names available to economic workers concerned with some of these species, and in subsequent taxonomic and biological papers to make easier discussion of the various forms now recognized. It is hoped that the publication of these descriptions will stimulate entomological interest in the genus, since it now appears that it is widely distributed through the world on pine hosts, and probably includes several additional new species beyond those here and previously described. The relationship of some of these species is so close that excellent insect material of all the stages, in quantity, and much further study are needed for their proper characterization, and especially for the establishment of a basis for the accurate differentiation of the species in any stage in which they may be encountered. For a basic characterization of the genus and other details of structure and habit reference should be made to two papers by F. B. Herbert (Ent. Soc. Wash. Proc., vol. 21, n. 7, Oct. 1919, pp. 157–161, and vol. 23, n. 1, Jan. 1921, pp. 15–22), and for a discussion of the relationship of this genus to other coccids reference may be made to the paper by the present writer on the classification of the Margarodidae (U. S. Dept. Agr. Tech. Bull. 52, 1928, pp. 48–53).

The inconspicuousness of most of the members of this genus is really extraordinary, and on this account the securing of satisfactory study material usually demands painstaking and critical examination of supposedly infested host material. Therefore, there should be special mention of the careful work of Miss Louise M. Russell, of the Bureau of Entomology and Plant Quarantine, who recovered and prepared for study most of the specimens discussed in the following descriptions. She should in each case be given collector's credit for the material obtained as a result of her examination of herbarium specimens of the genus *Pinus* in the herbaria of the United States National Museum, of the Arnold Arboretum and the Gray Herbarium of

Harvard University, of the New York Botanical Garden, of Yale University, and of the Connecticut Agricultural Experiment Station. The type material of the new species here described is included in the National Collection of Coccidae.

Matsucoccus alabamae, new species.

Occurring in cracks and crevices in the heavy bark of the host pine; adult female producing secretion at oviposition.

Adult female.—Relatively large; length, as mounted, 5.8 to 6.5 mm., width 1.9 to 2.5 mm. Parallel sided to very elongate ovoid. Membranous throughout. Antennae characteristic for the genus, the sixth to ninth segments inclusive each with a pair of stout sensory spines. Legs not unusual, the trochanters each normally with a single long seta. Mouth parts suggested only by a fold in the derm. Thoracic and the seven pairs of abdominal spiracles normal for the genus, the posterior abdominal slightly smaller than the anterior. With posterior apical cluster of 50 to 70 multilocular disk pores, and with bilocular tubular ducts scattered over body, clearly in segmental arrangement on the abdomen, the first and second complete bands behind the posterior legs each including around 30 such ducts; these tubular ducts in profile in their widest dimension showing the inner ends of the tubes plainly, although not prominently, swollen and lobate. Body setae all delicate and small, especially in relation to the body size, an average mid-dorsal seta about 7.5 μ, longest ventral about 16 μ, shortest in same transverse row about 10 μ; with 3 or 4 small intercoxal setae inside each coxa, longest perhaps 12 μ. Dorsal cicatrices not numerous, around 200 to 300 in 4 or 5 transverse clusters on posterior half of abdomen, size medium, but variable, 8–14 μ.

Intermediate female.—(Described from cast skins.) Probably normally globular if not subjected to pressure, broadly elliptical as mounted, 2.5 to 3 mm. long, 1.75 to 2 mm. wide, posterior apex broadly rounded. Derm somewhat sclerotized, showing a lightly areolate pattern in a broad band along body margin. Trachea entering thoracic spiracles on anterior face, abdominal on posterior side; all spiracles shallowly invaginated, the length of atrium to pore plate less than its diameter; tracheal entrance in thoracic spiracle enlarged into a conspicuous subatrium nearly as large in diameter as pore plate, a similar but less conspicuous subatrium present in each abdominal spiracle; abdominal spiracles plainly smaller than thoracic and gradually smaller from first to last, pore plates small, and especially so in relation to size of insect, thoracic with 17 to 22 small pores, anterior abdominal with about 10 pores, apical with 6 or 7.

*Larva.**—Characteristic for the genus, without lobes or other unusual struc-

*Herbert (reference cited) and Howard L. McKenzie (in litt.) have indicated that in certain species of *Matsucoccus* the active larva which hatches from the egg molts to produce a second active larva, almost or entirely identical structurally with the one coming from the egg. Although many larvae have been examined in connection with the description of these new species, no definite evidence supporting this has been obtained and the larval descriptions here given consequently make no differentiation between two such stages.

tural modifications, each abdominal spiracle set at inner end of a tiny but distinct sclerotized cup.

This new species has been described from three lots of specimens collected on *Pinus* sp., at Calhoun, Ala., March 16 and 31, and April 21, 1902, by A. M. Troyer, all presumably from the same tree. According to notes made by Theo. Pergande at time of receipt of specimens, the collector reported hundreds of specimens on one pine tree. The original sending was said to have included adult males, but specimens of these, unfortunately, have not been located in the coccid collections.

The large size of the adult female of this insect, combined with the presence of multilocular disk pores and of small setae only in the ventral abdominal area is sufficient to isolate it in a group including *vexillorum* and *californicus*. From the first it may be distinguished by its somewhat larger size, distinctly fewer dorsal cicatrices, and fewer tubular ducts anteriorly and in the two bands just behind the posterior legs. It is extraordinarily close to the second species, so close in all observed morphological details, in fact, that if the representatives of the two species came from adjacent localities and related hosts, the temptation would be great to ascribe the observed differences to variation. In the adult female the most obvious difference is in the shape of the bilocular ducts, which are swollen at the inner ends, as described above, in *alabamae*, but have practically straight sides, although somewhat divergent toward the inner ends, in *californicus*. These specimens from Alabama were erroneously placed as *Matsucoccus matsumurae* Kuwana by the writer in 1928 (reference cited).

Matsucoccus bisetosus, new species.

Probably occurring on the heavy bark of the host trees in crevices and cracks; adult female producing a mass of woolly white threads at oviposition.

Adult female.—As mounted, elongate ovoid, broadest at or behind middle of abdomen; length 3.25 to 5 mm., width 1.4 to 2.5 mm., depending in part on amount of distension. Derm membranous throughout. Antennae characteristic for genus, normally, apparently, with a single sensory spine on fifth segment, smaller than but similar to those in pairs on the remaining distal segments, this spine sometimes not visible and perhaps detached or even wanting. Mouth parts more or less developed. Legs about as usual for the genus, except the trochanters, each of these normally bearing two long and relatively conspicuous setae, instead of the single one usually found on this leg segment, these attaining a length of from 68 to 90 μ. Spiracles not unusual, the thoracic conspicuously larger than the abdominal, the anterior abdominal a little larger than the posterior. With multilocular disk pores at posterior apex of body, usually from 60 to

90 altogether, and with bilocular tubular ducts, present along body margins in small numbers on anterior portion and in transverse bands on abdomen, the first and second of these bands with from 30 to 50 such pores. Body setae fairly elongate, an average mid-dorsal about 7.6 μ, genital 11 to 13 μ, largest mid-ventral abdominal 30 to 41 μ, smallest (submarginal) ventral in same area 6 to 8 μ; each intercoxal cluster with 3 to 4 setae, the longest of these 35 to 45 μ. Dorsal cicatrices fairly numerous, in 5 to 7 recognizable transverse clusters, total present in material checked from 180 to 280, size range around 5 to 7 μ.

Intermediate female.—Stout, probably normally globular to stoutly elliptical, but usually distorted by pressure; diameter, as mounted, 1.7 to 2.5 mm. Lightly sclerotized, derm not exhibiting any evident pattern. Spiracles fairly large, tracheae entering on anterior edge of pore plate in thoracic and posterior edge in abdominal, as with other American species, but without traces of subatrium; thoracic and anterior abdominal spiracles about the same size, posterior abdominal gradually somewhat smaller; pore plates fairly large, showing evidence of an outer dark band. Not exhibiting any clearly defined protrusion, cleft, vertical septum, or other structural peculiarity at posterior apex of body.

Larva.—(Described from cast skins only.) Apparently characteristic for the genus, not exhibiting any marked structural peculiarities or any at present recognized as distinctive.

This insect has been described from material from the western part of the United States as follows: On *Pinus ponderosa*, near Willow Spring, Lassen National Forest, Calif., collected August 8, 1936, by F. C. Craighead (holotype and paratypes), and from Hat Creek, Lassen County, Calif., collected July 26 and August 23, 1938, by H. L. McKenzie (paratypes); on *Pinus jeffreyi*, Eagle Lake, Lassen National Forest, Calif., collected August 10, 1936, by K. A. Salman (paratypes).

Placed here also, although not included in the type series, are specimens obtained from samples of *Pinus jeffreyi* collected 1.2 miles north of Brockway, Calif., on May 18, 1934, by G. E. Paxton and G. H. Godfrey, and received through the Division of Forest Pathology of the Bureau of Plant Industry, and from *Pinus ponderosa* from Cleveland National Forest, Calif., July 23, 1934, from the same collectors and source, and, tentatively, specimens from under bark of *Pinus ponderosa* obtained from pine material collected at Monument, Colo., in the summer of 1935, by Carl Hartley.

Only a comparatively small amount of material of this species has been available for examination but the evidence from it suggests that the presence of two long setae on every trochanter in the adult female is definitely characteristic and that the presence of a single sensory spine on each fifth antennal segment in normal specimens may likewise be fairly distinctive. The adult female should be positively recognizable from these two characters in association with the other structural details covered in the description. Bisetose trochanters have been

observed in other species here described but only with great rarity, and thus far with no more than one to an individual, indicating clearly that the occurrence is one of minor abnormality.

Matsucoccus californicus, new species.

Occurring on the heavy bark of the host tree, in cracks and crevices; adult female producing a secreted ovisac at maturity.

Adult female.—Extraordinarily close to *alabamae*, differing positively, so far as now known, only in the shapes of the bilocular tubular ducts, these with the tubes in widest profile slightly and uniformly widened from outer to inner end, with sides straight in contrast to *alabamae* with its pores distinctly swollen and somewhat lobate at inner end. Body, as mounted, membranous throughout. Length 5 to 7 mm., width 1.5 to 2.5 mm., average toward the larger sizes. Antennae characteristic for genus, with pairs of sensory spines on the sixth to ninth segments inclusive. Legs characteristic for the genus, trochanters each with a single long seta, this about 80 μ long. Mouth parts more or less developed, but none observed fully so. Spiracles present in usual nine pairs, the thoracic distinctly larger than the abdominal, the anterior abdominal only a little larger than the posterior. With a few multilocular disk pores, probably usually around 50 to 60, at posterior apex of body and with bilocular tubular pores scattered over body, the two bands immediately behind posterior legs with only a few such pores, perhaps 25 or fewer in each. Derm setae small and slender, those anterior to genital area in the ventral abdominal area probably not exceeding 15 μ and usually 12 or 13 μ, with the shortest in the corresponding transverse row about 8 μ; intercoxal setae in clusters on derm ventrally inside coxal attachments likewise small and slender, probably not exceeding 13 μ. Dorsal cicatrices intermediate in size, 7.5 to 9.5 μ, usually in 3 or 4 short transverse bands on intermediate portion of dorsal surface of abdomen, probably normally totalling 150 to 200, sometimes fewer.

Intermediate female.—Corresponding to the adult female in its extraordinarily close resemblance to the intermediate stage of *alabamae*. Somewhat larger, cast skins as mounted reaching a length of 3.5 mm. and a width up to 2.6 mm., and the subatrium in each of the abdominal spiracles somewhat less pronounced than in *alabamae*, but depth of atrium slight as in that species. Otherwise without tangible differences, so far as has been determined from the limited study material available for examination.

Larva.—Only fragments available, characteristic for the genus, differing from *alabamae* in that the anterior abdominal spiracles have very little sclerotized cup or ring around opening and are not invaginated, while the posterior ones show only moderate development of this sort. The sclerotization and invagination are more evident in all spiracles in *alabamae*.

This insect has been described from several specimens (holotype and paratypes) of the stages mentioned on *Pinus ponderosa* from Burgess Spring, Harvey Valley, Lassen National Forest, Calif., collected August 2, 1936, by K. A. Salman (36–10).

The close relationship between this species and *alabamae* has been indicated in the discussion of that species and in the preceding description. These two and *vexillorum* agree in having the setae in the transverse rows on the ventral surface of the abdomen of the adult female all slender, inconspicuous, and relatively short, although this characteristic is least pronounced in *vexillorum*.

Matsucoccus degeneratus, new species.

Occurring completely concealed till maturity between sheath and needles at base of needle bundle; tip of abdomen protruding at maturity.

Adult female.—As mounted, very elongate, broadest across anterior third of body, tapering uniformly to a narrow, deeply incised posterior end, length 4 to 5.25 mm., greatest width 1.4 to 1.5 mm. Derm membranous throughout. Antennae much reduced, only two or three definitely recognizable segments present, the apical with one relatively large and stout sensory seta at tip, the remaining setae short and stiff but apparently not of the sensory type. Eye spot present, small, circular, surrounded by a small sclerotized area. Legs represented by somewhat differentiated areas in derm, each bearing several setae of various sizes, and a rather slender, protruding claw. No traces of mouth parts. Spiracles not unusual, the thoracic plainly larger than the abdominal, the anterior four abdominal pairs larger than the posterior three, with each spiracle of this anterior group opening at the apex of a distinct, but not conspicuous, slightly sclerotized cone, but each of the posterior ones opening flush with the body surface and without plate or cone around opening. Body without multilocular disk or other derm pores, but with the generically characteristic short bilocular tubular ducts, these, however, very few in number, apparently confined to the posterior three abdominal segments. A few small to medium setae scattered over the body, the longest, in the pregenital ventral abdominal area, about 27 μ, the shortest here about 8.5 μ. Dorsal cicatrices of medium size, measured range 6.5 μ to 11 μ, average probably around 8 to 9 μ, in five or six rows, total around 243, each row extending around the body margin onto the ventral surface.

Intermediate female.—In early period, before final distension, small, about 1.5 to 1.75 mm. long and 0.8 mm. wide, usually elongate ovoid, with tendency toward formation of an almost acute posterior apex; later (cast skin) with anterior portion of body much elongated, appearance usually very elongate conical, mostly tapering nearly uniformly from head to tip of abdomen, or irregular, due to adjacent pressure, length then 4.5 to 5 mm., width up to 1.5 mm. Derm distinctly but not heavily sclerotized over most of surface. Each spiracle with its axis forming an acute angle with the surface on which it opens as in *fasciculensis* and *secretus*, and each pore plate appearing as if provided with a thicker outer band, as in *secretus;* spiracles maintaining approximately same spacing in early and late periods of development, the conspicuous late body

enlargement resulting almost entirely from a great elongation of that portion of body lying anterior to beak and anterior spiracles, and presumably designed both to provide room for the adult female and larvae and to force the posterior apex of the body into the open to assist the larvae in their emergence. Posterior apex of abdomen narrow and rounded, showing internally a plainly developed median vertical septum corresponding in position to the notch of the adult female, and externally a slight notch at the extreme tip of the body, this abdominal tip lost in cast skins, evidently due to need to provide emergence opening for larvae.

Larva.—Apparently identical in appearance with the first-stage larva of *fasciculensis;* thus far no basis for differentiating this stage of these two species established.

This insect has been described from several specimens of the different stages, including holotype adult female and paratypes of this and other stages collected from *Pinus ponderosa* twig blight samples obtained on Colcord Mountain, Tonto National Forest, Ariz., December 3, 1935, by R. W. Davidson of the Division of Forest Pathology, Bureau of Plant Industry (68832).

Although not included in the type series, specimens on *Pinus* sp. from the mountains near Pachucha, Hidalgo, Mexico, collected by Louise M. Russell from herbarium material obtained June 1, 1899, by J. N. Rose, seem clearly to represent this species.

In the adult female stage this species is readily differentiated from all other known *Matsucoccus*, except *subdegeneratus*, by the elongated, posteriorly tapering shape and the conspicuous reduction of the antennae and especially of the legs. From *subdegeneratus* it is distinguished by the greater reduction in legs and antennae as well as through the retention of a full set of abdominal spiracles and the development of the conspicuous cleft at the apex of the abdomen. The elongated, posteriorly tapering preadult cast skin seems to be distinctive in both these species, but *subdegeneratus* appears to split vertically on the median line at its apex to permit larval emergence, so there is no loss of the apex of the abdomen as in *degeneratus*, and, of course, the differences in the abdominal spiracles parallel the condition in the adult female stages of the two species.

Matsucoccus eduli, new species.

Occurring frequently, and perhaps characteristically, deeply imbedded in the axils of small branches of the host, with presence indicated only by gum exudations; also present exposed in twig axils and in crevices caused by bark injuries.

Adult female.—Elongate elliptical, head end narrowed somewhat more than posterior end. Of medium size, length as mounted around 4.5 mm., width around 2 mm. Derm membranous throughout. Antennae characteristic for

genus, sixth to ninth segments inclusive with pairs of stout sensory spines. Legs characteristic for genus, with only a single long seta on each trochanter. Mouth parts more or less completely developed. Spiracles not unusual. With a cluster of around 50 to 75 multilocular disk pores at posterior apex of body; bilocular tubular ducts present, in transverse rows on abdomen, around 30 in each of the two circles behind posterior legs, a similar row between posterior thoracic spiracles, a very few along margin anterior to this but the total on head and anterior thoracic segments greatly reduced to give impression of complete absence of pores in this area. Body setae fairly elongate but not conspicuous, those in the ventral rows anterior to genital area reaching a length of 45 μ, with the shortest here, near margin, about 9.5 μ, some of intercoxal setae also attaining length up to 45 μ. Dorsal cicatrices normally present in 6 rows, with a total of around 260 cicatrices, usual diameter around 7 to 7.5 μ.

Intermediate female.—Fully developed form or cast skin circular, flattened by pressure, around 2.5 mm. in diameter, posterior apex in properly oriented specimens exhibiting two short rounded lobes separated by a short median vertical cleft. Derm lightly sclerotized, not exhibiting any definite pattern. Spiracles placed close to surface. Atrium relatively very large, but shallow, pore plate of moderate size but relatively conspicuously pedicillate, each trachea opening into a large subatrium, of diameter approaching or even exceeding that of accompanying pore plate, this described spiracular condition most conspicuous in cast skins or fully matured intermediate females, thoracic spiracles largest, abdominal gradually smaller to apical.

Larva.—Characteristic for the genus but with the abdominal spiracles, except the first pair, each opening into a well developed, invaginated, sclerotized cup of relatively large diameter, so large that with the posterior spiracles the interspaces between cups appear shorter than the cup diameters.

This species has been described from a few adult and immature females from central and northern Arizona as follows: From typical *Pinus edulis*, collected along the Jerome-Flagstaff road about 10 miles east of Clemenceau, Ariz., April 27, 1936, by Harold Morrison (holotype and paratypes), the same, 11 miles, and the same, 15 miles, beyond Clemenceau; from typical *Pinus edulis*, collected along Lynx Creek road, near Black Canyon road, Prescott National Forest, April 28, 1936, by Harold Morrison; from single-leaf form of *Pinus edulis*, collected along Copper Basin road, 5 miles south of Prescott, April 29, 1936, by Harold Morrison and H. G. West; another collection from the last locality, made May 9, 1936, by H. G. West; and another collection from the same locality (entrance to Copper Basin area) made February, 1937, by Jack N. Orr.

Although the adult female of this insect is not conspicuously differentiated from related species—it is probably closest morphologically to *M. gallicolus*—the spiracular characteristics of the intermediate female and first-stage larva, as described above, appear to be distinctive and should satisfactorily establish the identity of the species. Thus far it has been discovered

only on *Pinus edulis*, and it may prove that restriction to this host, or to it and the related *P. monophylla*, is likewise an acceptable distinctive characteristic. The complete burial of many individuals in the soft phloem tissue in the axils of the twigs is a curious adaptation, which may be an accidental one only, resulting from the rapid growth of the host tissue subsequent to the attachment of the first-stage larva, but it is evident from the injured condition of the plant tissue as it appears in split infested forks and from the gum exudations which signalize the presence of the *Matsucoccus* that definite damage can result from these infestations. It seems reasonable to suppose that critical survey work will greatly widen the known distribution of this species, since it has been found thus far wherever its host has been properly examined.

Matsucoccus gallicolus, new species.

Occurring during the growing stage in small pustule galls on the young twigs of the host pines; adult females usually emerging and migrating to oviposit.

Adult female.—As mounted, elongate, tapering slightly to a rounded posterior end and a somewhat sharper anterior end, of moderate size, but this varying appreciably; range in material examined, length 2 to 4.5 mm. (one, apparently abnormal, specimen 1.5 mm.), width 0.8 to 1.65 mm. (abnormal specimen 0.6 mm.). Membranous throughout. Antennae characteristic for genus, with pairs of sensory spines on segments 6 to 9 inclusive; legs characteristic for genus, with a single large trochanter seta, very rarely with a second such seta. Mouth parts wanting or more or less developed. Spiracles characteristic for genus, the seven abdominal pairs nearly equal in size. With multilocular disk derm pores at apex of abdomen, the number ranging from 13 to 31 in material tabulated, and with short tubular ducts, scattered over both surfaces of body, clearly in segmental rows in abdominal region. Body with the usual few small scattered setae, those in the mid-ventral area of the abdomen, however, fairly long—up to 42 μ in an average or large specimen—and much longer than the smallest seta (submarginal) in the corresponding row, which may be less than 9 μ in length. Dorsal cicatrices numerous, in from 5 to 10 rows across the intermediate abdominal segments, total number present ranging from about 150 to 350 with the average for material tabulated around 241; individual cicatrices small, ranging from 2.7 to 5 μ, with an average around 3.5 μ.

Intermediate female.—Quite distinctive in shape, presumably owing to effects of inclosure within the tissue of the host, appearing at maturity, or as a cast skin, as a flat conical, approximately circular disk having the tip of the body central at the apex of the disk and at the opening formed through the host bark when the second stage emerged from the first larva and penetrated the plant tissue. Diameter 1 to 1.6 mm. Derm moderately sclerotized and in the cast skin appearing irregularly wrinkled and roughened but without evident areolate or striate pattern. Spiracles small, the pore plates with comparatively few pores, the abdominal spiracles gradually smaller posteriorly and usually with

each spiracle of the posterior three pairs lying at the anterior end of a deep and often conspicuous groove in the derm.

Larva.—Elliptical, small, length about 0.26 mm., width about 0.15 mm. Antennae comparatively short, terminal segment stout, abdominal spiracles without any traces of sclerotic collar, cup, or plate around opening of each. This stage otherwise paralleling the structural condition found normally in the larvae of the genus, but apparently unique in the molting method, since the second stage emerges through the ventral face of the larva and penetrates the host tissue directly beneath the larval skin.

Third and second stages, but no adults of the male series, have been located in material that has been available for study. The second-stage male closely resembles the same stage in the female series, differing only, perhaps, in the smaller number of pores in the spiracular pore plates in the male. The third-stage larvae are hardly satisfactory for study, but show the antennae stouter, the body size smaller, and the cicatrices and apical multilocular disk pores lacking as compared with the adult female.

The species as here recognized has a wide distribution through the pine areas of the Eastern States. The holotype female came from the farm of Mrs. E. Bethel about 6 miles from Stroudsburg, Pa., collected there on *Pinus rigida* by E. C. Pyle, April, 1936, and this may be regarded as the type locality for the insect. In addition, however, specimens have been included in the paratype series that came from the following localities and hosts:

New Hampshire: Nashua, collected on *Pinus rigida*, May 27, 1937, by Thaddeus J. Parr.

Massachusetts: On *Pinus rigida*, collected by Louise M. Russell from pine samples in the Gray Herbarium, Harvard University, from Cataumet, October 26, 1913, M. L. Fernald, Eastham, May 30, 1913, F. S. Collins, and Sandwich, June 9, 1916, Fernald and Hunnewell, all from Barnstable County; from New Bedford, Bristol County, E. W. Hervey; from Needham, May 23, 1883, T. O. Fuller, and Norwood, May 31, 1897, E. F. Williams, both in Norfolk County; from Jamaica Plain, C. E. Faxon, in Suffolk County; additional Massachusetts specimens on *Pinus rigida* come from Cape Cod, sent in to the Bureau of Entomology and Plant Quarantine on account of injury by Wm. Becker, November, 1935.

Rhode Island: On *Pinus rigida*, collected by Louise M. Russell from Gray Herbarium pine samples from near Nayatt, May 30, 1911, E. J. Winslow, and near Johnston, May 30, 1911, J. S. Collins.

Connecticut: On *Pinus rigida*, Chaplin, February 13, 1937, collected by R. C. Brown, Willamantic, June 7, 1937, collected by Thaddeus J. Parr; collected by Louise M. Russell on herbarium samples from Gastonburg, May, 1903, F. W. Starmer,

in the Yale University Herbarium, and from Stafford Springs, May 23, 1929, G. B. Clinton, in Connecticut Agricultural Experiment Station Herbarium.

New York: On *Pinus rigida*, collected by Louise M. Russell from pine samples in Gray Herbarium from West Fort Ann, May 27, 1896, S. H. Burnham, and from Southampton, Long Island, June, 1893, W. N. Clute, in New York Botanical Garden Herbarium; much additional material is included from collections made in August, October, and December, 1919, by J. F. Morton or L. C. Griffiths at Centerport, Long Island.

New Jersey: On *Pinus rigida*, Barnegat, from pine samples collected July 22, 1936, by R. R. Whitten, between Tom's River and Tuckerton, from pine samples collected February 18, 1937, by May, and from Millville, May 27, 1934, Adams and Thebes, collected by Louise M. Russell from herbarium samples in Arnold Arboretum Herbarium.

Pennsylvania: In addition to the holotype material, already cited (on *Pinus rigida*, farm of Mrs. Bethel, near Stroudsburg, Pa., collected April, 1936, by E. C. Pyle), the paratype material includes specimens collected at the same locality, July, 1936, by C. W. Collins, and July 24, 1936, by Harold Morrison; on the same host, collected at State Forest Park, Mont Alto, Pa., September, 1935, by J. C. Kase, July 26, 1936, by Harold Morrison, and January, 1937, by J. C. Kase; from Pond Bank Division, Mont Alto State Forest, March, 1937, J. C. Kase; on *Pinus echinata*, Mont Alto, Pa., January 30, 1937; from Pond Bank Division, Mont Alto State Forest, Pa., March, 1937, and on *Pinus ponderosa* (!), Sprow District near Renova, collected June, 1937, by J. C. Kase; specimens from herbarium material collected by L. M. Russell include examples on *Pinus rigida*, Delaware Water Gap, May, 1899, F. E. Floyd, New York Botanic Garden Herbarium; on *Pinus echinata*, Chester County, Rothrock collection, Arnold Arboretum Herbarium; and on *Pinus* sp., Wilkesbarre, April, 1903, E. Paddock, Gray Herbarium.

Maryland: Collected by Louise M. Russell on *Pinus taeda* from herbarium samples from Crisfield, September 4, 1924, G. M. Merrill, in Arnold Arboretum Herbarium, and from Pocomoke River, May 15, 1905, F. Hains, in U. S. National Herbarium; on *Pinus virginiana*, Elk Neck, Cecil County, June 4, 1923, W. L. Abbott, in Arnold Arboretum Herbarium.

District of Columbia: On *Pinus virginiana*, Good Hope Hill, Anacostia, collected March 19, 1905, and April 8 and 27, 1906, by J. G. Sanders, April 12, 1936, by Harold Morrison, April 15, 1936, by Morrison and Russell, and May 11, and July 23, 1936, by Louise M. Russell.

Virginia: On *Pinus virginiana*, Franklin Park, East Falls Church, collected April 20, and August 11, 1936, by Ida Weckerly; on *Pinus taeda*, collected from herbarium samples by

Louise M. Russell from material from Princess Anne County, May 9, 1898, T. H. Kearney, Jr., and from Cape Henry, October 17, 1909, I. Tidestrom, both in U. S. National Herbarium; and from *Pinus* sp. from 20 miles south of Richmond, April 28, 1933, G. P. Clinton, in Connecticut Agricultural Experiment Station Herbarium.

North Carolina: On *Pinus echinata*, Bent Creek, Asheville, April 22, 1937, collected by F. C. Craighead, and May 8 and 17, 1937, collected by B. H. Wilford; on *Pinus rigida*, Asheville, collected May 8 and 17, 1937, by B. H. Wilford.

Georgia: All collected from herbarium samples by Louise M. Russell, on *Pinus glabra*, Summerville, March 25, 1907, G. R. Shaw, in Arnold Arboretum Herbarium, and St. Mary's River, May 1, 1921, in U. S. National Herbarium; on *Pinus serotina*, "Georgia," in Gray Herbarium; on *Pinus virginiana*, Hurricane Creek, Tuscaloosa County, December 5, 1905, R. M. Harper, in Arnold Arboretum Herbarium and U. S. National Herbarium, and near Birmingham, April 13, 1929, E. J. Palmer, in Arnold Arboretum Herbarium.

Florida: Collected from herbarium samples by Louise M. Russell on *Pinus glabra*, Chattahoochee, November (?), A. H. Curtiss, in U. S. National Herbarium and New York Botanical Garden Herbarium.

Tennessee: Collected from herbarium samples by Louise M. Russell on *Pinus echinata*, Campbell County, June 21, 1935, L. V. Cline, in Arnold Arboretum Herbarium.

Missouri: Collected from herbarium samples by Louise M. Russell, on *Pinus echinata*, north fork of White River, Ozark County, October 7, 1927, E. J. Palmer, Arnold Arboretum Herbarium.

Ohio: Collected from herbarium samples by Louise M. Russell on *Pinus rigida* from C.C.C. Camp Gordon, Shawnee State Forest, Scioto County, April 25, 1934, D. Demaree.

In the present state of our knowledge of *Matsucoccus*, positive recognition of this species rests almost entirely on the gall-forming habit of the intermediate stage with its associated modification of the shape and orientation of the body of the insect. The adult female can be recognized with reasonable assurance through the combination of relatively small size, possession of a few apical multilocular disk pores, presence of relatively large and small setae in each of the transverse ventral rows in the abdominal region, presence of numerous small dorsal cicatrices in several rows, and presence of a single long seta on each trochanter. The complete absence of any sclerotic rim or plate around the flush abdominal spiracles in the first larva may prove to be distinctive, but this stage has not yet been studied with sufficient thoroughness to provide final opinion on this point. It is conceivable that this species might, in some cir-

cumstances, develop on the surface of the host twigs as do some of the others, and that there would be no body distortion under such conditions, but thus far no such externally developing specimens have been recognized in material that has been studied. There is decided variability in size, number of dorsal cicatrices, and other characters in the adult females of the material that has been included in the type series, but no sound basis for the establishment of added species or subordinate segregates has been observed. This is the insect which was figured and described (in part) by Herbert (reference cited) under the name *matsumurae*.

Matsucoccus paucicicatrices, new species.

Occurring on the young twigs of the host trees, usually on the bark in the angle formed by the attachment of the needle bundle to the twig much as with *Matsucoccus vexillorum*.

Adult female.—A small species, length up to 2.7 mm., width to 1.1 mm. but averaging a little smaller, as mounted, elongate ovoid, widest across the middle of the abdomen. Derm membranous throughout. Antennae characteristic for genus, the intermediate joints more deeply constricted than in some other species, and also differing from other known species having genital multilocular disk pores in having stout sensory spine pairs on the fifth to ninth segments inclusive. Legs characteristic for genus. Mouth parts more or less developed. Spiracles not unusual. With multilocular disk pores at posterior apex of body, but the number much reduced in comparison with other species, except *gallicolus*, observed range from 20 to 40; tubular ducts small, few, first complete band behind posterior legs with about 15 to 20 ducts, anterior portion of body with 1 to 4 such ducts on each margin of each segment, none through middle portion of body. Body setae actually small, but larger in relation to body size, longest ventral abdominal 20 to 27 μ, shortest in corresponding row 5 to 7.5 μ; setae inside each coxal attachment about same as longest ventral abdominal setae. Dorsal cicatrices small, 4.7 to 6.8 μ, circular to elliptical, and conspicuous because of their small number, showing only some 15 to 30 scattered over the dorsal middle portions of the posterior abdominal segments.

Intermediate female.—Small, probably normally stout elliptical, but almost invariably distorted by pressure; length up to 1.25 mm., width up to 0.8 mm.; derm definitely sclerotized over exposed portions but not exhibiting any evident pattern. Spiracles small, each placed at bottom of a short but distinct tube, pore plates with around 16 tiny pores and showing more or less obviously the heavier outer band or section so conspicuous in some other species; size somewhat variable, thoracic spiracles little if any larger than abdominal, except posterior, these usually but not invariably a little smaller; no traces of a subatrium, tracheae entering directly into edge of pore plate, on anterior edge in thoracic spiracles, on posterior in abdominal. Posterior apex of body protruding slightly from the uniform curve, showing a distinct, though shallow, vertical cleft with internal septum at extreme apex.

Larva.—(Described from cast skins only.) Apparently characteristic for the genus; not exhibiting any recognized distinctive specific characteristics; with a very narrow sclerotized collar around each abdominal spiracle, these neither invaginated nor with intermediate marginal projections.

Male second stage.—Smaller than second-stage female, elliptical, spiracular pore plates smaller and with fewer pores.

Adult male.—Only a few fragments available, insufficient for description but suggesting that the stage is apterous, lacks the cluster of tubular ducts toward apex of abdomen, and has compound eyes somewhat reduced and irregularly facetted.

This species has been described from small quantities of material taken from several host pines and widely separated localities as follows: On *Pinus lambertiana*, Eight Mile, Yosemite National Park, Calif., collected June 27, 1936 (Hopkins U. S. 31905), and May 10, 1937 (Hopkins U. S. 32126), by G. R. Struble (holotype and paratypes); Sierra Nevada Mountains, Calif., collected by Louise M. Russell from herbarium material obtained by J. G. Lemmon in 1875; Galice District, Rogue River National Forest, Oreg., collected September, 1936, by R. L. Furness, and Siskiyou National Forest, Oreg., collected June 11, 1937, by R. L. Furness; on *Pinus monticola*, Chagoopa Plateau, Upper Kern River, Calif., collected June 20, 1923, by G. F. Ferris; on *Pinus flexilis*, Old Marias Pass (E. Slope), Montana, collected by Louise M. Russell from herbarium material obtained in August, 1882 or 1883 by C. S. Sargent, now in Arnold Arboretum Herbarium, and from Elk Mountain, Saratoga, Wyo., collected June 1, 1938, by D. DeLeon and C. L. Massey (Hopkins U. S. 31509–G); on *Pinus* sp., Rimrock Crater at the Palisades, Crater Lake National Park, Oreg., collected by Louise M. Russell from material in U. S. National Herbarium obtained September 14, 1902, by F. V. Coville.

The marked reduction in the number of dorsal cicatrices in the adult female, the presence of a pair of sensory spines on the fifth antennal segment, possibly a unique characteristic among the species having apical multilocular disk pores, and the small size of the adult and intermediate stages of this insect should make it definitely recognizable, especially when coupled with one of the indicated host associations, since these, so far as known, all belong to the white pine group of species.

Matsucoccus secretus, new species.

Occurring characteristically secreted deeply within the bundle sheath at the base of the needle bundle.

Adult female.—As mounted, membranous throughout, very elongate ovoid, broadest across posterior portion of abdomen, narrowed anteriorly, length up to 4.5 mm., greatest width up to 2 mm. Antennae characteristic for genus, length

up to 0.8 mm., segments from fifth to ninth inclusive bearing pairs of heavy sensory setae. Legs characteristic for the genus, length of posterior up to 1.25 mm., each trochanter with a single large subapical ventral seta. Thoracic and the seven pairs of abdominal spiracles characteristic for genus. Without multilocular disk pores at the posterior apex of the body as in some species, the generically characteristic bilocular tubular ducts present, but apparently confined to the margins and the posterior apical portions of the abdomen. With some small setae scattered over both surfaces of body, obviously in segmental arrangement on abdomen, and in addition with a few conspicuously enlarged setae, near coxae on thorax, in mid-section of each segment on abdomen, those on abdomen attaining a length up to 75 μ, with the smallest in the same row not over 10 μ. Dorsal cicatrices numerous, apparently, from the limited material available for study, varying considerably in numbers, maximum probably totaling around 770 in 10 rows, large, diameter ranging from 15 to 23 μ with the average probably around 20 μ.

Intermediate female.—(Described from cast skin.) Probably stout elliptical to ovoid, distorted by pressure, much smaller than adult, perhaps never much more than 2.25 mm. long. Cast skin lightly sclerotized, pale brown, surface appearing smooth, neither striated nor marked off into areolate patterns by color differences. Framework of mouth parts large and conspicuous. Spiracles present in the normal two thoracic and seven abdominal pairs, all large, the posterior abdominal somewhat smaller than the thoracic, tube of each set at an acute angle with the plane of the surface surrounding its opening, each tube short, tracheal tube entering thoracic spiracles on anterior curve of bottom, but on posterior curve in all abdominal spiracles; pore plates deep, giving impression, when viewed from above, of small inner lighter area surrounded by a heavier band.

Larva.—Mostly characteristic for the genus, but with antennae more elongate and slender than in many other species and differing from all thus far discovered in having the last four pairs of abdominal spiracles opening at the apices of conspicuous protruding digitate membranous tubercles, with much smaller marginal protruding membranous tubercles similar to those of *fasciculensis* interposed between these and between the anterior nontuberculate spiracles.

Male second larva.—(Described from cast skin.) Readily distinguished from the corresponding female stage by its more slender shape and somewhat smaller size, length less than 2 mm., width about 0.9 mm. Spiracular structure as in the female larva.

Male third larva.—Length about 2.25 mm., membranous throughout, similar in appearance to adult female except for size, lack of dorsal cicatrices, and stouter individual antennal segments. No other male stages available for study.

This species has been secured from a number of different localities in the western part of the United States, suggesting a wide distribution, and always from *Pinus ponderosa*. Detailed localities included in the type material are Colorado, Monument, summer of 1935, collected from pine samples obtained in the field by Carl Hartley (holotype adult female and paratypes of all described stages); Colorado Springs, from pine samples

collected in field March 27, 1936, by J. A. Beal (larvae), and Black Forest, north of Colorado Springs, from pine samples collected in field May 16, 1936, by C. R. Donaldson (larva); New Mexico, Policia Canyon, Santa Fe National Forest, from pine samples collected in field, May 28, 1936, by W. H. Long and V. O. Sandberg (larva and second stage); Arizona, Rose Creek, Tonto National Forest, collected from pine samples obtained in field December 3 and 4, 1935, by R. W. Davidson (68831) (larva), same, Indian Garden Ranger Station, December 3, 1935 (68830), Oak Creek, Coconino National Forest, from pine samples collected in field by R. W. Davidson (68828) (larval skin and intermediate female), north of Flagstaff, collected from pine samples obtained in field November 30, 1935, by R. W. Davidson (larval skin and intermediate female), Prescott National Forest, several localities including Copper Basin, from pine samples collected in field March 11, March 31, April 8, and April 16, 1936, by Forest Pathology (larva), Iron Springs, from pine samples collected in field March 18, 1936, by Forest Pathology (larvae) and April, 1937, by J. C. Nave, Forest Supervisor (larval skin and intermediate female), Lynx Creek, C.C.C Camp, from pine samples collected in field November 29, 1935 (68746) (larva and intermediate female), by R. W. Davidson and May 10, 1936 (adult female), by Harold Morrison, Peterson Area, from pine samples collected in field November 29, 1935 (larval skins, intermediate female), by R. W. Davidson, and February 17, 1936, by Forest Pathology.

Additional specimens not included in the type material are from Nevada, near Reno, collected by Louise M. Russell from herbarium pine samples obtained in field September 20, 1910, by A. A. Heller (U. S. National Herbarium 309663) (adult female); California, near Willow Springs, Lassen Nat. Forest, from pine samples, collected in field by F. C. Craighead (adult female, larva); and Mexico, San Jose Mountains, Sonora, collected by Louise M. Russell from herbarium material obtained in field August 3, 1893, by E. A. Mearns (No. 1591) (U. S. National Herbarium 231329) (larva), and Chihuahua, collected by Louise M. Russell from herbarium material obtained in field June 3, 1908, by E. Palmer (Nos. 329 and 330) (U. S. National Herbarium 573795 and 573796) (this material labeled *Pinus* sp.) (larval skin, second-stage female).

This species is very closely related to *fasciculensis* Herbert, differing conspicuously only in the first larval stage, and here only in the four protruding posterior abdominal pairs of spiracles. Both species have the anterior spiracles set at the bottom of a large cup, but the posterior ones of *fasciculensis* are likewise so placed, and both species have the protruding tubercles between the spiracles. The adult females apparently may be separated by the large number of dorsal cicatrices (probably at

east 450 or usually more) and the longer enlarged ventral abdominal setae (around 70 μ) in *secretus* in contrast to the fewer cicatrices (probably not over 300) and shorter enlarged setae (probably not over 50 μ) of *fasciculensis*. No satisfactory basis has developed as yet for the separation of the intermediate stages of the two species.

Matsucoccus subdegeneratus, new species.

Occurring imbedded in sheath around base of needle.

Adult female.—As mounted, very elongate, slender, tapering toward tip, length 5 mm., width of anterior portion of body 1 mm., of posterior portion of abdomen 0.5 mm. Membranous throughout. Antennae located near anterior apex of body, close together, somewhat reduced, apparently 6- or 7- segmented, but condition obscured in specimen studied, stout sensory setae present on the three apical segments at least, segments not departing evidently from the characteristic *Matsucoccus* type. Eye spot small, placed close to antennal base on each side. Legs strongly reduced, total length about 90 to 100 μ. No trace of mouth parts. Thoracic spiracles apparently characteristic for the genus; abdominal spiracles obscure, poorly developed, only three pairs through middle section of abdomen clearly observed. No multilocular disk pores at posterior end of abdomen or elsewhere; a few of the generically characteristic bilocular tubular ducts at posterior apex of abdomen, apparently lacking elsewhere. With a few small setae scattered over body both dorsally and ventrally and with some pairs of longer ones ventrally in the thoracic region. Dorsal cicatrices intermediate in size, from 7 to 10.5 μ in diameter, not abundant, about 216 in 4 transverse rows and an apical cluster at posterior end of abdomen as follows: 5 (anterior), 25, 64, 72, about 50 (apical), the ends of the last two rows and the apical cluster extending on to the ventral side of their abdominal segments.

Intermediate female.—(Described from cast skin only.) About 3.5 mm. long, elongate, largest at anterior end and tapering to a slender abdominal tip, color of cast skin very dark brown, almost blackish, much of its surface densely transversely striate. Two pairs of normally developed thoracic spiracles and three pairs of normally developed abdominal spiracles, all with axis of tube parallel to longitudinal axis of body and hence with opening forming an acute angle with this axis, tracheal tube in each entering bottom of spiracle on the morphologically posterior side of the pore plate; four additional recognizable pairs of abdominal spiracles behind the three normal pairs, but all these greatly reduced, tiny and almost structureless.

This species has been described from a single mounted adult female and its cast preadult skin collected by Louise M. Russell from an herbarium sample of *Pinus occidentalis* (*cubensis*) in the Arnold Arboretum Herbarium. The plant material was collected at Moncion, Monte Cristi Province, Dominican Republic, October, 1929, by E. J. Valeur (252). It may be differentiated easily from all other known *Matsucoccus* by the reduction in number of abdominal spiracles in both adult and preadult stages

and more obviously by the partial reduction of the antennae and legs in the adult females. It seems clearly to be most nearly related to *degeneratus,* which it closely resembles in shape and habitus.

Matsucoccus vexillorum, new species.

Normally occurring during the growing stage on the twigs of the host, characteristically wedged into the angle formed by twig and needle bundle; often with three or four at each such point and the area involved, when infestation is heavy, extending over 2 or 3 years' growth and into injured areas of the older bark. Adult females emerging from the preadult stage and migrating to the tips of the twigs or to roughened areas in the bark for oviposition, secreting a mass of shining fluffy wax threads at posterior apex of abdomen, this gradually invaginating as the eggs are laid.

Adult female.—As mounted, elongate ovoid, broadest across the posterior part of the abdomen, to almost parallel sided, with rounded ends; distended length, as mounted, around 4 to 5 mm., width 1.5 to 2 mm. Membranous throughout. Antennae 9-segmented, normal for the genus, the terminal segment fairly elongate, a pair of stout sensory spines on segments 6 to 9 inclusive. Legs characteristic for the genus, normally a single stout seta on each trochanter. Mouth parts usually wanting, the area represented by a folded or wrinkled area in the derm, rarely more or less developed even to the point of appearing normal, with stylets, and possibly functional. Spiracles present in the normal two thoracic and seven abdominal pairs, the posterior abdominal gradually smaller. Derm with a cluster of multilocular disk pores at posterior body apex, numbering around 70 to 80, number of loculi to the pore from 10 to 14; in addition with the generically characteristic conspicuous bilocular tubular ducts in transverse segmental rows across both surfaces of the body, the two complete circles immediately behind the posterior legs each including 50 to 60 ducts. Body setae all small and in fact very small for size of body, maximum (in ventral abdominal area) probably not exceeding 18 μ and usually less, the size ratio between largest and smallest setae in the posterior ventral abdominal rows rarely exceeding 3 : 1 and usually less, and sometimes as little as 2 : 1. Dorsal cicatrices numerous, from 400 to 800 or perhaps even more but mostly around 600 to 700, usually in 6 or 7 transverse rows, but the number of such rows ranging from 5 to 8, size small, mostly around 5 μ diameter, but exhibiting an observed range of 3.6 to 9 μ.

Intermediate female.—(Described from cast skin.) Tending toward a globular form, but almost invariably distorted owing to pressure of adjacent plant material; length around 2 mm., but varying considerably, the variation in part due also to effects of compression. Exposed portions of body definitely and relatively rather strongly sclerotized, protected portions less affected, some portions showing a fairly distinct areolated pattern. With the usual two pairs of thoracic and seven pairs of abdominal spiracles, the tracheae entering the

anterior curve of the bottom of the thoracic spiracles and the posterior curve of the abdominal spiracles; pore plates not showing a conspicuous double-thickness band as in *secretus*, for example, but with numerous small pores (around 25 in thoracic and 18 in anterior abdominal spiracles); apex of body characteristically terminating in a short, conical, almost cauda-like extension.

Larva.—Showing no unusual features, length of recently hatched larva 400 μ, width 155 μ, length of antenna 84 μ. Spiracles in 9 pairs, minute, the two thoracic appearing distinctly smaller than the abdominal owing to presence of a small but distinct, cup-shaped, invaginated, sclerotized area around each abdominal spiracle.

Adult male.—Adhering very closely to the appearance characteristic of the genus as typified by the male of *matsumurae*, the only male previously described. Setae in dorsal cluster on prothorax and abdominal segments longer and more numerous; possibly some slight but characteristic differences in the shapes of the internal apodemes of meso- and metathorax.

Male third larva.—Much smaller than female, length about 1.7 mm., width 0.42 mm.; membranous throughout, antennae, legs, and spiracles much as in adult female, the antennal segments stouter, each showing somewhat less pronounced basal constriction; body without disk pores or cicatrices, with tubular ducts scattered, not numerous, most abundant in cephalic area. Ventral abdominal setae attaining a maximum length of about 17 μ.

Male second larva.—More elongate in shape than corresponding stage of female, length around 1.3 mm., width around 0.9 mm., moderately sclerotized, the exposed portions more heavily so, much of derm exhibiting a fairly distinct areolate pattern. Spiracles as in corresponding female stage, but smaller and with fewer pores in plates, thoracic with about 16, first abdominal with about the same; apical projecting cone quite evident.

A relatively large amount of material of this species has been available for examination. The host in all collections is *Pinus ponderosa*. The holotype adult female was selected from specimens collected from pine samples obtained in the Copper Basin Area, Prescott National Forest, near Prescott, Ariz., March 11, 1936, by Forest Pathology. Paratype specimens of the various stages described come from host samples from the following sources: Arizona, Prescott National Forest, Copper Basin area, pine samples collected February 17, March 11, 15, 24, 27, and 31, and April 8 and 16, 1936, by Forest Pathology; junction Copper Basin, Paradise Valley Roads, samples February 17, 1938, by Forest Pathology; Groom Creek area, samples March 19, 1936, by Forest Pathology; Iron Springs area, samples March 18, 1936, by Forest Pathology, February, 1937, by J. N. Orr, and March and April, 1937, by J. C. Nave, Forest Supervisor; Lynx Creek Area, near C.C.C. Camp, April 30, and May 8 and 10, 1936, specimens collected by Harold Morrison; November 15, 1936, sample material collected by J. N. Orr; April, 1937, samples collected by J. C. Nave; above Walker, collected May 9, 1936, by H. G. West; Peterson area, host sample collected

February 17, 1936, by Forest Pathology; junction Senator and Upper Groom Creek Roads, samples taken February 17, 1936, by Forest Pathology; Thumb Butte Area, samples taken March 18, 1936, by Forest Pathology; Prescott National Forest without closer placing, from pathological samples collected June, 1934, by Carl Hartley, May 24, 1935 (Hopk. U. S. 21189), and April 11, 1937, by J. M. Miller, and January 25, and February, 1937, by Cleveland; Coconino National Forest, Baker's Butte, specimens collected May 8, 1936, by Morrison and West; New Mexico, Mimbares Area, Gila National Forest, from pine samples collected February 21, 1936, by W. H. Long and V. O. Sandberg, and Policia Canyon, Santa Fe National Forest, collected May 28, 1936, by Long and Sandberg.

The insect pretty certainly occurs outside the limits indicated by the above listed distribution records, but no careful collecting of satisfactory study specimens has been undertaken in adjacent regions.

The name applied has been given at the desire of Dr. F. C. Craighead in order to signalize the present belief that this insect is associated with the conspicuous type of injury to the small branches of ponderosa pine in the Southwest which has been given the name "flagging" by field workers who have studied it.

This species associates fairly clearly with *alabamae* and *californicus*, the adult female resembling them in having actually and proportionately small setae only in the mid-ventral area of the posterior abdominal segments. It is somewhat smaller than either of these species and has many more bilocular tubular ducts in the two circles around the abdomen posterior to the hind pair of legs and over the entire anterior portion of the body, and many more dorsal cicatrices.

SOIL CONSERVATION VERSUS INSECT CONTROL.

By Kenton L. Harris.

With the publication of the 1938 United States Department of Agriculture Yearbook concerned with the immediate national importance of soil rebuilding and maintenance, and the possibility of a cooperative study of the relationship between entomological problems and erosion control now proposed by the United States Department of Agriculture, there is brought to light the importance of detrimental results arising from certain insect control practices. The possibility that control measures may have undesirable effects and so prove harmful to food production and consumption has always faced the economic entomologist. Recently this effect has been broadened by the